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(54) Lavatory blocks containing enzymes.

(57) A solid lavatory block comprising an enzyme system. Said lavatory blocks are environmentally compatible and provide enhanced stain removal.

EP 0 619 367 A1

Field of the Invention

The present invention relates to solid lavatory cleansing blocks containing enzymes. The block is designed to have good stain removal capacity.

Background of the Invention

Lavatory blocks for cleansing and deodourizing the lavatory bowl are well known in the art. Such lavatory blocks typically comprise surfactants and chlorinating compounds which provide the desired cleansing and deodourizing properties.

However, the lavatory blocks disclosed in the prior art do not efficiently address the problem of stain removal of physiological soils which are frequently found in the lavatory bowl. The surfactants contained in the lavatory blocks on the market are not present in sufficiently high concentrations in order to achieve optimum improved stain removal. Chlorinating agents due to their bleaching action are known for their stain removal ability. The in-bowl stain removal action of said chlorinating agents is limited at low concentrations.

It is therefore an object of the present invention to provide an efficient stain and grease removal system incorporated in a solid lavatory block which is completely environmentally safe.

In response to these objectives, the present invention proposes to formulate a lavatory block comprising an enzyme system as a stain removal active.

The blocks according to the present invention progressively dissolve in water, thereby releasing the ingredients in solution. Thus, a permanent aqueous solution is provided in the lavatory bowl which comprises a constant and predetermined amount of various ingredients.

An advantage of the present invention is that the enzymes are permanently active in the lavatory bowl water during the whole period in between lavatory flushes.

Summary of the Invention

The present invention is a solid lavatory block characterized in that it comprises from 0.1% to 50% of an enzyme system, whereby said lavatory block provides a permanent aqueous solution comprising an effective amount of said enzyme system as said block is progressively dissolved in said lavatory bowl water.

All ratios, percentages and parts given herein are "by weight" unless otherwise specified.

Detailed Description of the Invention

The present invention relates to a solid lavatory cleansing block. There are two types of lavatory blocks available on the market at present, in-rim and in-cistern type lavatory blocks. The in-rim type blocks are distinct from in-cistern type blocks in that they are designed to be hung from the rim of the lavatory bowl, in a conventional type rim cage. The in-cistern type blocks are designed to be placed in the cistern itself. Depending on the positioning of the block the properties of the active ingredients will vary, depending on the length of time the block is immersed in water. The lavatory blocks according to the present invention are designed to be used as both in-rim and in-cistern type lavatory blocks.

The blocks according to the present invention progressively dissolve in water, thereby releasing the ingredients in solution. Thus, a permanent aqueous solution is provided in the lavatory bowl which comprises a constant and predetermined amount of various ingredients.

The lavatory blocks of the present invention comprise as an essential feature from 0.1% to 50%, preferably from 1% to 40%, more preferably from 2% to 25% of an enzyme system. Suitable enzymes which may be used are selected from lipases, proteases, cellulases, amylases, polysaccharide hydrolases and mixtures thereof. The preferred enzyme for use herein is lipase.

Typically lavatory blocks according to the present invention comprise a lipase enzyme such that the lipolytic activity of the lavatory block is from 0.01 to 5000 KLU, preferably from 0.1 to 1000 KLU, most preferably from 1 to 150 KLU per gram of the lavatory block. KLU are standard kilo units defined by Novo for measuring lipase activity.

The lavatory blocks according to the present invention typically comprise a protease enzyme such that the protolytic activity of the lavatory block is from 0.01 to 500 KNPU, preferably from 0.05 to 200 KNPU, most preferably from 1 to 100 KNPU per gram of the lavatory block. KNPU denotes Kilo Novo Protease Units.

The lavatory blocks according to the present invention typically comprise an amylase enzyme such that the amylolytic activity of the lavatory block is from 0.01 to 500 KNU, preferably from 0.1 to 250, most preferably from 1 to 100 KNPU per gram of the lavatory block. KNU are Kilo Novo units used for measuring amylase activity.

Typically, lavatory blocks according to the present invention comprise a cellulase enzyme such that the cellulytic activity of the lavatory block is from 0.01 to 50 000 CEVU, preferably from 0.1 to 10 000 CEVU, more preferably from 1 to 1500 CEVU per gram of the lavatory block. CEVU are standard units for measuring cellulase activity.

Commercially available enzymes for use herein include :

- protease of Bacillus, especially from B. licheniformis (e.g. Alcalase(R) and from alkalophilic Bacillus strains according to US 3 723 250 (e.g. Savinase(R)) (both available from Novo Industri A/S).
- Alpha-amylase of Bacillus, especially B. licheniformis, Termamyl(R) (Novo Industri A/S).
- Protease of Fusarium, especially F. oxysporum, US 3 652 399 (Takeda), PCT/DK 89/00001.
- Cellulase of Humicola, especially H.Insolens. Celluzyme(R).(Novo Industri A/S), Us 4 435 307 (Novo).
- Lipase of Humicola, especially H. lanuginosa, Lipolase(R) (Novo), EP 305 216 (Novo) and US 4 810 414 (Novo).

The enzyme system assists in the removal of faecal, urine and grease stains which are found in the lavatory bowl. It is believed that enzymes, especially lipases are effective in removing the stains found in the lavatory bowl by attacking the components present in faeces which represent a significant fraction of the faecal soil.

The lavatory blocks according to the present invention may also contain a number of optional ingredients. One such ingredient is a surfactant system. The incorporation of a surfactant provides increased cleansing of the lavatory blocks and provides a solid matrix in which all the other ingredients can be incorporated. The block comprises at least 10% of a surfactant system. The surfactants that may be used herein can be anionic and nonionic surfactants or mixtures thereof.

The anionic surfactants which may be used in the present invention include for example alkali metal salts of alkyl substituted benzene sulphonates, alkali metal alkyl sulphonates, alkali metal alkyl sulphonates and alkali metal alkyl ether sulphates derived for example from fatty alcohols and alkyl phenols, alkali metal alkane sulphonates, alkali metal olefin sulphonates and alkali metal sulphosuccinates, whereby the sodium salts are preferred. Most preferred are sodium alkyl metal sulphonates and sulphates.

The nonionic surfactants which may be used can be chosen from any liquid or solid ethoxylated C_6-C_{24} fatty alcohol nonionic surfactant, fatty acid C_6-C_{24} alkanolamides, C_6-C_{20} polyethylglycol ethers, polyethyleneglycol with molecular weight 1000 to 80000 and C_6-C_{24} amine oxides.

The lavatory blocks of the present invention may further comprise from 0.001% to 10%, preferably from 0.001% to 3% soluble calcium salts. The calcium salts can be used to stabilize the enzymes.

The lavatory blocks of the invention may further comprise 0% to 50%, preferably from 5% to 30%, fillers of inorganic salts such as sodium sulphate, sodium carbonate, sodium silicate and less preferably phosphorous sodium salts, for example sodium triphosphate, or inert fillers such as clay, urea or calcite. The fillers can be used to adjust the mechanistic properties of the lavatory blocks so that the active ingredients are released in the desired manner.

The differences in the composition of the in-rim and in-cistern type lavatory blocks of the present invention can be exclusively but not necessarily dependant upon the type of surfactants, fillers and polymers used therein, to determine the dissolution rate. The composition differences are well known in the art. In-cistern type lavatory blocks can preferably contain surfactants with a lower solubilization rate and may be chosen from long chain higher anionics or nonionics with a high degree of ethoxylation. In-cistern type lavatory blocks may also contain specific ingredients to decrease the solubilization rate such as slowly dissolving polymers or oils.

The lavatory blocks of the present invention may further comprise as an optional feature from 1ppm to 500ppm, preferably from 5ppm to 300ppm, more preferably from 10ppm to 200ppm active oxygen in the lavatory bowl water. The source of active oxygen can be selected from hydrogen peroxide or sources thereof, preformed peroxyacids, organic peroxides and mixtures thereof. As used herein active oxygen concentration refers to the percentage concentration of elemental oxygen, with an oxidation number zero, that being reduced to water would be stoichiometrically equivalent to a given percentage concentration of a given peroxide compound, when the peroxide functionality of the peroxide compound is completely reduced to oxides.

A hydrogen peroxide source according to the present invention refers to any compound which produces hydrogen peroxide when said compound is in contact with water. Suitable water-soluble sources of hydrogen peroxide for use herein include persulphates, percarbonates, metal oxides and perborates.

Suitable preformed peroxyacids for use in the lavatory blocks according to the present invention include diperoxydodecandioic acid DPDA, magnesium perphthalate, perlauric acid, perbenzoic acid, diperoxyazelaic acid and mixtures thereof. The blocks according to the present invention comprise from 0.01% to 30% of said preformed peroxyacids.

Suitable organic peroxides for use in the lavatory blocks according to the present invention include diacyl and dialkyl peroxides such as dibenzoyl peroxide, dilauroyl peroxide, dicumyl peroxide and mixtures thereof. The blocks according to the present invention comprise from 0.01% to 30% of said organic peroxides.

Optionally, the lavatory blocks may additionally comprise peracid precursors, i.e. compounds that upon reaction with hydrogen peroxide produce peroxyacids. Examples of peracid precursors suitable for use in the present invention can be found among the classes of esters, amides, imides and anhydrides such as acetyl triethyl citrate (ATC), tetra acetyl ethylene diamine (TAED), succinic or maleic anhydrides. All of these bleaching agents are environmentally compatible and odourless.

Another optional component of said system is an acid or alkali. The acid or alkali is used to ensure that the pH of the lavatory bowl water is in the range of pH 4 to pH 10. The stability and activity of the enzymes of the present invention can be optimized by ensuring that the pH of said lavatory bowl water is at the optimum level for the enzyme used herein.

The acids of the present invention that may be used for this purpose may in addition have the advantage that they can form small concentrations of the corresponding peracids by reaction with hydrogen peroxide in-situ, thus enhancing the overall performance of the lavatory block. These acids can be further selected so as to have chelating and/or building properties, which results in limescale removal. The acids that can be used in the present invention are organic or inorganic acids, preferably organic acids such as citric, maleic, oxalic succinic and tartaric acids, more preferably citric and maleic acids.

The alkalis that may be used in the present invention include sodium hydroxide, potassium hydroxide, alkali metal hydroxides, alkaline earth metal hydroxides and amines, for example monoethylamine, monoethanolamine and triethanolamine.

Another additional ingredient of the lavatory block is a chelant system. The chelant system improves the overall limescale/rust removal performance. Furthermore, the chelant system may improve the stability of the bleaching agent in the formulation. Suitable chelants may be chosen from EDTA, NTA or preferably from biodegradable chelants such as s,s-ethylene diamino disuccinate and dipicolinic acid.

Further optional ingredients include perfumes and dyes used to improve the aesthetics of the lavatory block. These perfumes and dyes contained in the lavatory block are selected for their stability in the presence of the source of active oxygen. In a preferred embodiment of the present invention, where said blocks comprise perfumes and dyes, it is desirable to manufacture said blocks in a process whereby said perfumes and dyes can be premixed with the enzymes and the other optional ingredients, before the addition of the source of active oxygen if said compound is a component of the lavatory block.

The lavatory cleansing block is formed by conventional methods well known in the art as described for instance in EP-A 462 643. The ingredients are mixed to form a dough of suitable consistency which can then be extruded and cut into lengths to form blocks. The extrusion process can be carried out by using simple conventional extrusion equipment such as usually used for manufacturing soap bars. Alternatively, the lavatory blocks may be prepared by compressing all of the ingredients into a block.

The present invention is further illustrated by the following examples.

Examples

The following compositions are made by combining the listed ingredients, in the listed proportions.

EXAMPLES No. 1,2,3,4	1	2	3	4
Ingredients	Weight %			
Sodium Coconut Alkyl Sulphate	50	53	55	55
Lutensol AO3O	5	2	-	-
Sodium Sulphate	30	30	28	28
Lipolase^{R} 100L	10	5	5	5
Savinase^{R} 8.0L	-	5	5	3
Celluzyme^{R}	-	-	2	2
Perfume	4	4	4	4
Dyes or pigments, water	Balance	Balance	Balance	Balance

EXAMPLES No. 5,6,7,8	5	6	7	8
Ingredients	Weight %			
Sodium Coconut Alkyl Sulphate	50	50	50	55
Lauryl Ether Sulphate	3	3	3	-
Sodium Sulphate	10	10	13	15
Lipolase^{R} 100L	5	5	5	5
Savinase^{R} 8.0L	3	3	3	-
Sodium Persulphate	-	10	10	8
Citric Acid	20	10	10	10
Dipicolinic Acid	3	3	3	-
Perfumes	5	5	5	6
Dyes or pigments, water	Balance	Balance	Balance	Balance

Claims

1. A lavatory cleansing block **characterized in** that it comprises from 0.1% to 50% of an enzyme system, whereby said block provides a permanent aqueous solution comprising an effective amount of said enzyme system as it dissolved in the lavatory bowl water.

2. A lavatory cleansing block according to claim 1, wherein said enzyme system comprises enzymes selected from lipases, cellulases, proteases and amylases or mixtures thereof.

3. A lavatory cleansing block according to claim 2, wherein said enzyme is a lipase.

4. A lavatory cleansing block according to claims 1 to 3, wherein said permanent aqueous solution has a pH from 4 to 10.

5. A lavatory cleansing block according to claims 1 to 4, further comprising above 10% of a surfactant system.

6. A lavatory cleansing block according to claims 1 to 5, further comprising from 1ppm to 500ppm of active oxygen as said block is progressively dissolved in said lavatory bowl water.

7. A lavatory cleansing block according to claim 6, wherein said source of active oxygen is selected from hydrogen peroxide or a source thereof, preformed peroxyacids, peroxides and mixtures thereof.

8. A lavatory cleansing block according to claims 1 to 7, further comprising from 0% to 20% of a chelant system.

9. A lavatory cleansing block according to claims 1 to 8, further comprising from 0% to 50% of a filler system.

10. A lavatory cleansing block according to claims 1 to 9, further comprising from 0% to 20% of an peracid precursor.

11. The use of an enzyme system in a lavatory cleansing block to remove stains in the lavatory bowl.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 20 1007

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DATABASE WPI Week 9305, Derwent Publications Ltd., London, GB; AN 93-042674 & JP-A-4 370 200 (ASAHI PEN KK) 22 December 1992 * abstract *	1-3,5-7, 11	C11D17/00 C11D3/386
A	DATABASE WPI Week 9217, Derwent Publications Ltd., London, GB; AN 92-138570 & JP-A-4 082 560 (DAISO KK) 16 March 1992 * abstract *	1-11	
A D	EP-A-0 258 068 (NOVO INDUSTRI A/S) * claims 1-22 * & US-A-4 810 414	1-11	
A	EP-A-0 271 152 (UNILEVER NV ET AL) * page 7, line 5 - line 30; claims 1-7 *	1-11	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A,D	EP-A-0 462 643 (UNILEVER NV ET AL) * page 2, line 33 - line 36; claims 1-12 *	1-11	C11D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	26 AUGUST 1993	SIATOU E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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